REMARKS

Claims 1-19 remain in this application. Claims 1-19 are rejected. Claims 1-6, 8-11, 13-15, 18 and 19 are amended herein to address matters of form unrelated to substantive patentability issues.

Applicants herein traverse and respectfully request reconsideration of the rejection of the claims cited in the above-referenced Office Action.

Claims 1-19 are rejected as obvious over Stall et al. (US 5,336,324) in view of Koppel (US 5,619,548) under 35 U.S.C. §103(a). The applicants herein respectfully traverse this rejection. For a rejection under 35 U.S.C. §103(a) to be sustained, the differences between the features of the combined references and the present invention must be obvious to one skilled in the art.

It is respectfully submitted that a *prima facie* case of obviousness has not been established in the rejection of claims 1-19. "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed

combination and the reasonable expectation of success must both be found in the prior art, and not based on the applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)." MPEP §706.02(j) "Contents of a 35 U.S.C. §103 Rejection".

In making the above rejections, the Examiner states that the Stall reference shows many features in Fig. 1 which applicants respectfully aver are, in actuality, entirely absent from the cited reference. For example, nowhere in the figures or text of the cited reference are X-ray windows disclosed. Furthermore, there is no teaching regarding an X-ray irradiation unit or detector, as stated in the Office Action. The portion of the reference cited by the Examiner merely explains, in the generalist of terms, that an X-ray diffraction unit may be used to measure thickness. While disclosing inclusion of an X-ray diffraction unit as part of a possible test apparatus, the reference is silent regarding whether such test apparatus is coupled in any manner with the disclosed apparatus for depositing the coating. Moreover, the reference fails to teach or suggest any particular placement of such X-ray diffraction unit relative to the deposition apparatus, and mentions the X-ray unit in the reference only once, and in passing. One skilled in the art reading the Stall et al. reference would receive no guidance regarding where or how to dispose the X-ray diffraction unit disclosed in Stall et al. such that a coating thickness on a substrate could be measured while inside the film deposition furnace. Furthermore, since Stall et al. is silent regarding the claimed X-ray windows, one of ordinary skill in the art would

not be lead to dispose an X-ray irradiation unit or detector outside of the furnace, since there would be no way suggested in the prior art reference as to how to reflect externally produced or received X-rays from the thin film while in the environment of the furnace.

While further alleging that these features are well known, the Examiner fails to provide any references which teach or suggest such features, as required for properly establishing a *prima facie* case of obviousness. Absent a reference teaching of how to incorporate the X-ray diffraction apparatus of the secondary Koppel into a deposition chamber of the type claimed, it is respectfully submitted that the combination of references is insufficient to support the Examiner's rejection.

Thus, it is respectfully submitted that the rejected claims are not obvious in view of the cited references for the reasons stated above. Reconsideration of the rejections of claims 1-19 and their allowance are respectfully requested.

Applicants respectfully request a three (3) month extension of time for responding to the Office Action. Please charge the fee of $930 for the extension of time to Deposit Account No. 10-1250.

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited. Please charge any deficiency or credit any overpayment to Deposit Account No. 10-1250.

Respectfully submitted,
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APPENDIX I

AMENDED CLAIMS WITH AMENDMENTS INDICATED THEREIN BY BRACKETS AND UNDERLINING

1. (Amended) A thin film measuring apparatus integrated into a thin film deposition system, comprising:

a sealed thin film deposition furnace comprising [a] an X-ray permeable X-ray incidence window and an X-ray extraction window;

thin film substance generating means for generating thin film deposition particles of a thin film substance in the thin film deposition furnace; and

substrate supporting means for supporting a thin film deposition substrate in the thin film deposition furnace at a position for allowing the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means to adhere on the surface of the substrate,

the thin film measuring apparatus comprising:

[a] an X-ray irradiation unit for irradiating [a] an X-ray through the X-ray incidence window toward the surface of the thin film deposition substrate supported in the thin film deposition furnace; and

[a] an X-ray sensing unit for sensing the X-ray reflected from the thin film deposition substrate through the X-ray extraction window,

the X-ray irradiation unit comprising [a] an X-ray source for emitting a divergent X-ray, and a curved monochromator for at least converting the divergent X-ray emitted from the X-ray source into a monochromatic X-ray and for allowing the monochromatic X-ray to converge on the thin film deposition surface of the thin film deposition substrate.

2. (Amended) A thin film measuring apparatus according to Claim 1, further comprising [a] an X-ray measurement apparatus for measuring a rocking

curve using as a measuring object a thin film having a mixed crystal structure or a superlatice structure formed on the surface of the thin film deposition substrate having a known Bragg angle,

the X-ray irradiation unit having a mean X-ray incident angle for [a] allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at around the known Bragg angle.

3. (Amended) A thin film measuring apparatus according to Claim 1, further comprising [a] an X-ray measurement apparatus for measuring X-ray reflectivity, wherein the X-ray irradiation unit has [a] an X-ray incident angle for [a] allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at a low angle range required for measuring X-ray reflectivity.

4. (Amended) A thin film measuring apparatus according to Claim 1, further comprising a control unit for controlling, by previously storing desired basic information for forming a thin film in the thin film deposition furnace, at least deposition and measurement of the thin film formed on the surface of the thin film deposition substrate based on the basic information.

5. (Amended) A thin film measuring method using the thin film measuring apparatus according to Claim 4, wherein measuring intervals with the thin film measuring apparatus [is] are shortened based on the basic information as deposition of the thin film comes to [its] an end.

6. (Amended) A thin film deposition system, comprising:

a closed thin film deposition furnace having [a] an X-ray permeable X-ray incidence window and X-ray extraction window;

thin film substance generating means for generating thin film deposition particles of the thin film substance in the thin film deposition furnace;

substrate supporting means for supporting a thin film deposition substrate in the thin film deposition furnace at a position for allowing the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means to adhere on the surface of the substrate;

[a] an X-ray irradiation unit provided at the outside of the thin film deposition furnace and irradiating [a] an X-ray through the X-ray incidence window toward the surface of the thin film deposition substrate supported in the thin film deposition furnace; and

[a] an X-ray sensing unit provided at the outside of the thin film deposition furnace and sensing the X-ray reflected from the thin film deposition substrate through the X-ray extraction window,

the X-ray irradiation unit comprising [a] an X-ray source for emitting a divergent X-ray, and a curved monochromator for at least converting the divergent X-ray emitted from the X-ray source into a monochromatic X-ray and for allowing the monochromatic X-ray to converge on the thin film deposition surface of the thin film deposition substrate.

8. (Amended) A thin film deposition system according to Claim 6 wherein, on the premise that X-ray reflectivity is measured, the X-ray irradiation unit has [a] an X-ray incident angle for allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at a low angle range required for measuring X-ray reflectivity.

9. (Amended) A thin film deposition system according to Claim 6, further comprising a control unit for controlling, by previously storing desired basic information for forming a thin film in the thin film deposition furnace, at least

deposition and measurement of the thin film formed on the surface of the thin film deposition substrate based on the basic information.

10. (Amended) A thin film deposition system, comprising:

a sealed thin film deposition furnace;

thin film substance generating means for generating thin film deposition particles of the thin film substance in the thin film deposition furnace;

substrate supporting means for supporting a thin film deposition substrate in the thin film deposition furnace at a position for allowing the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means to adhere on the surface of the substrate;

a measuring unit provided at a prescribed site communicating with the thin film deposition furnace, and being capable of disposing the thin film deposition substrate that serves as a thin film deposition sample substrate as a measuring object at a position for allowing the thin film deposition particles of the thin film substance flowing in from the thin film deposition furnace to adhere on the substrate;

[a] an X-ray incidence window and extraction window provided on the side walls of the measuring unit;

[a] an X-ray irradiation unit provided at the outside of the thin film deposition furnace and irradiating [a] an X-ray through the X-ray incidence window toward the surface of the thin film deposition sample substrate disposed within the measuring unit; and

[a] an X-ray sensing unit provided at the outside of the thin film deposition furnace and sensing the X-ray reflected from the thin film deposition sample substrate through the X-ray extraction window,

the X-ray irradiation unit comprising [a] an X-ray source for emitting a divergent X-ray, and a curved monochromator for at least converting the divergent X-ray emitted from the X-ray source into a monochromatic X-ray and for allowing

the monochromatic X-ray to converge on the thin film deposition surface of the thin film deposition sample substrate.

11. (Amended) A thin film deposition system according to Claim 10, further comprising exchange means for a thin film deposition sample substrate for exchanging the thin film deposition sample substrate or the surface thereof disposed in the measuring unit without changing the atmosphere in the thin film deposition furnace.

13. (Amended) A thin film deposition system according to Claim 10 wherein, on the premise that X-ray reflectivity is measured, the X-ray irradiation unit has [a] an X-ray incident angle for allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at a low angle range required for measuring X-ray reflectivity.

14. (Amended) A thin film deposition system according to Claim 10, further comprising a control unit for controlling, by previously storing desired basic information for forming a thin film in the thin film deposition furnace, at least forming of the thin film and measurement of the thin film formed on the surface of the thin film deposition substrate based on the basic information.
[thin film deposition and thin film measurement]

15. (Amended) A thin film deposition system comprising:

a sealed thin film deposition furnace having [a] an X-ray permeable X-ray incidence window and X-ray extraction window;

thin film substance generating means for generating thin film deposition particles of the thin film substance in the thin film deposition furnace;

substrate supporting means for supporting a thin film deposition substrate in the thin film deposition furnace at a position for allowing the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means to adhere on the surface of the substrate;

a shield member facing the surface of the thin film deposition substrate supported in the thin film deposition furnace;

a thin film deposition opening formed at a part of the shield member and for allowing a part of the thin film deposition substrate to expose so that the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means are adhered on the exposed part;

a sample thin film deposition opening formed at another part of the shield member and for allowing another part of the thin film deposition substrate to expose so that the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means are adhered on the another exposed part;

rotary drive means for relatively changing a part of the surface facing the sample thin film deposition opening by allowing the thin film deposition substrate to rotate;

[a] an X-ray irradiation unit disposed at the outside of the thin film deposition furnace and irradiating [a] an X-ray through the X-ray incidence window and the sample thin film deposition opening toward a part of the surface of the thin film deposition substrate supported in the thin film deposition furnace; and

[a] an X-ray sensing unit disposed at the outside of the thin film deposition furnace and sensing the X-ray reflected from a part of the surface of the thin film deposition substrate through the sample thin film deposition opening and the X-ray extraction window,

the X-ray irradiation unit comprising [a] an X-ray source for emitting a divergent X-ray, and a curved monochromator for at least converting the divergent

X-ray emitted from the X-ray source into a monochromatic X-ray and for allowing the monochromatic X-ray to converge on the thin film deposition surface of the thin film deposition sample substrate.

18. (Amended) A thin film deposition system according to Claim 15 wherein, on the premise that X-ray reflectivity is measured, the X-ray irradiation unit has [a] an X-ray incident angle for allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at a low angle range required for measuring X-ray reflectivity.

19. (Amended) A thin film deposition system according to Claim 15, further comprising a control unit for controlling, by previously storing desired basic information for forming a thin film in the thin film deposition furnace, at least forming of the thin film and measurement of the thin film formed on the surface of the thin film deposition substrate based on the basic information.